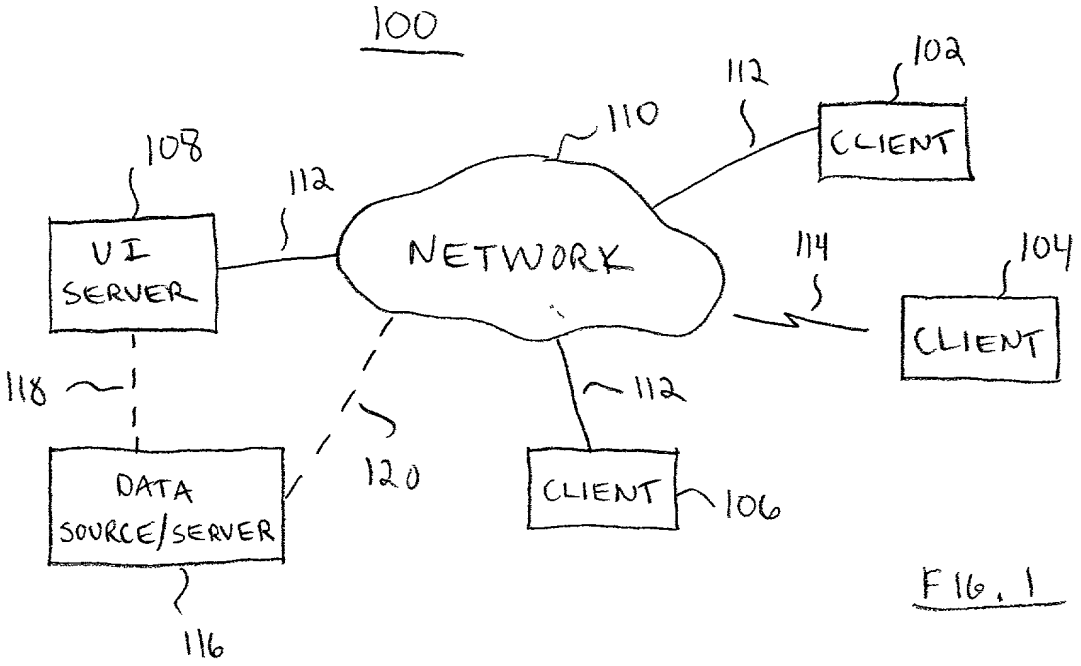
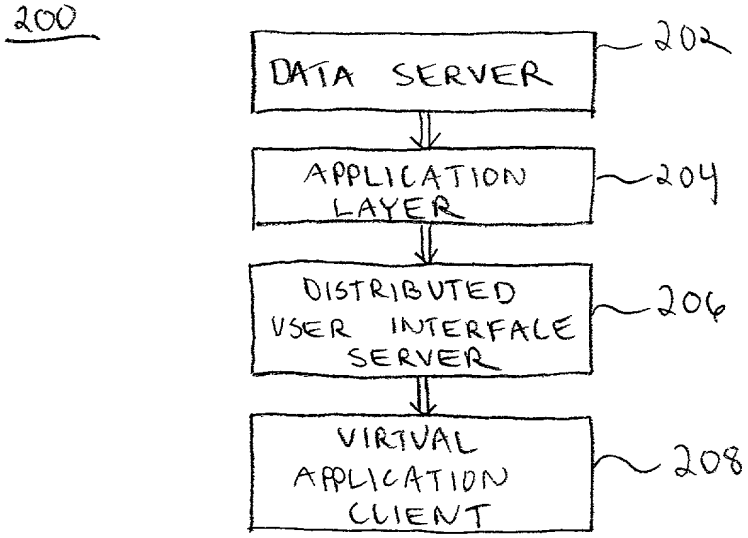

100
102
112
110
108
112
CLIENT
UI SERVER
NETWORK
114
104
CLIENT
118
112
120
DATA SOURCE/SERVER
CLIENT
106
116

F16. 1


200
DATA SERVER
202
APPLICATION LAYER
204
DISTRIBUTED USER INTERFACE SERVER
206
VIRTUAL APPLICATION CLIENT
208

F16. 2

PATENT SAMPLE

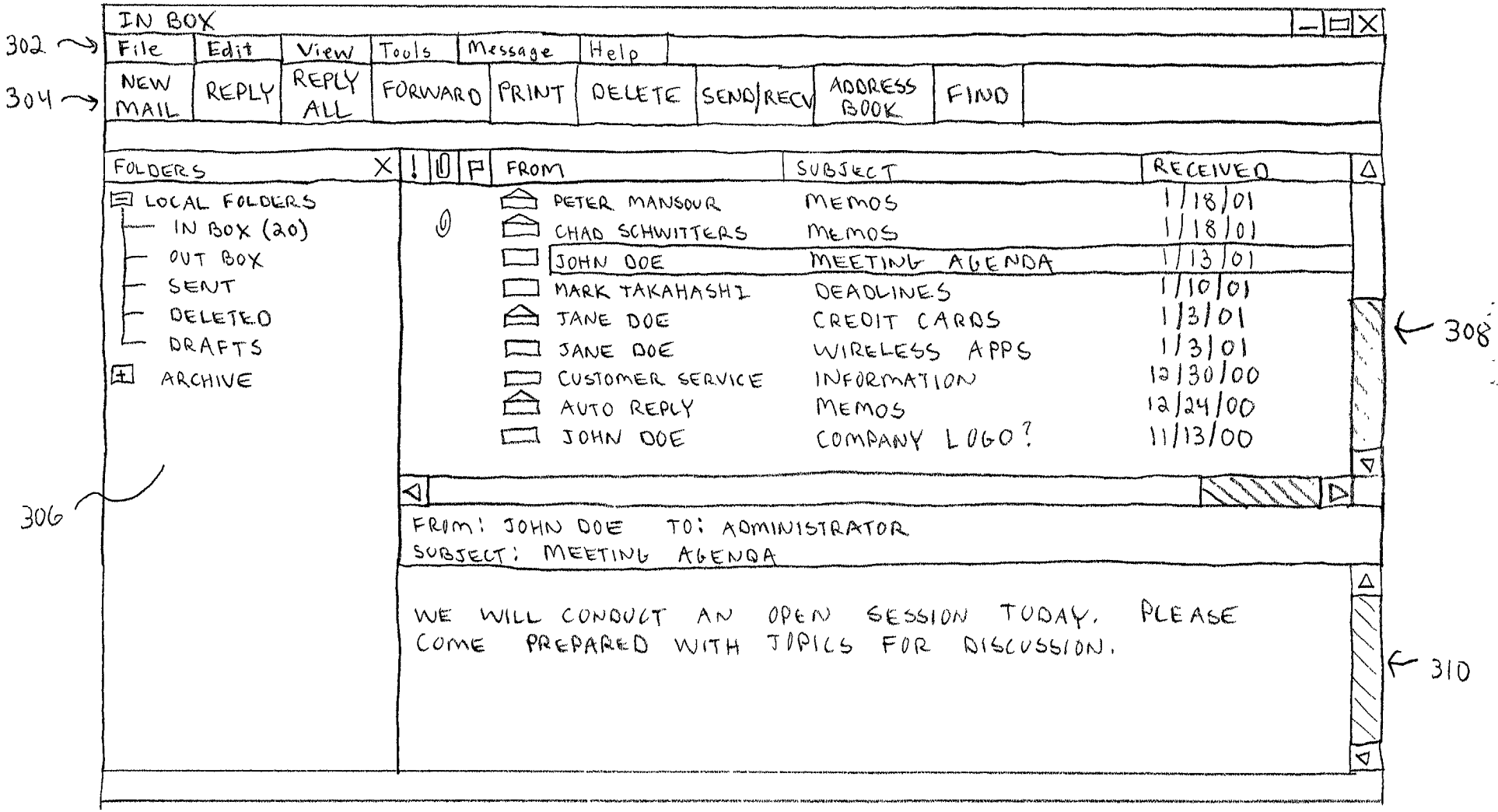


FIG. 3

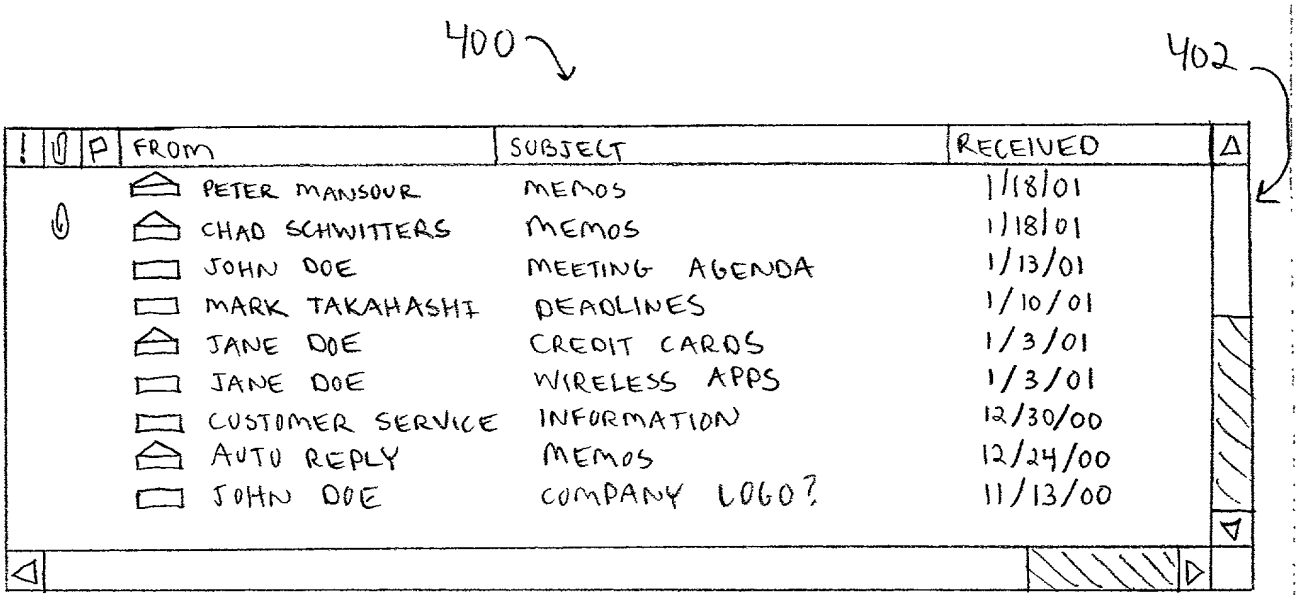

400
402
! P FROM SUBJECT RECEIVED
PETER MANSOUR MEMOS 1/18/01
CHAD SCHWITTERS MEMOS 1/18/01
JOHN DOE MEETING AGENDA 1/13/01
MARK TAKAHASHI DEADLINES 1/10/01
JANE DOE CREDIT CARDS 1/3/01
JANE DOE WIRELESS APPS 1/3/01
CUSTOMER SERVICE INFORMATION 12/30/00
AUTO REPLY MEMOS 12/24/00
JOHN DOE COMPANY LOGO? 11/13/00

FIG. 4

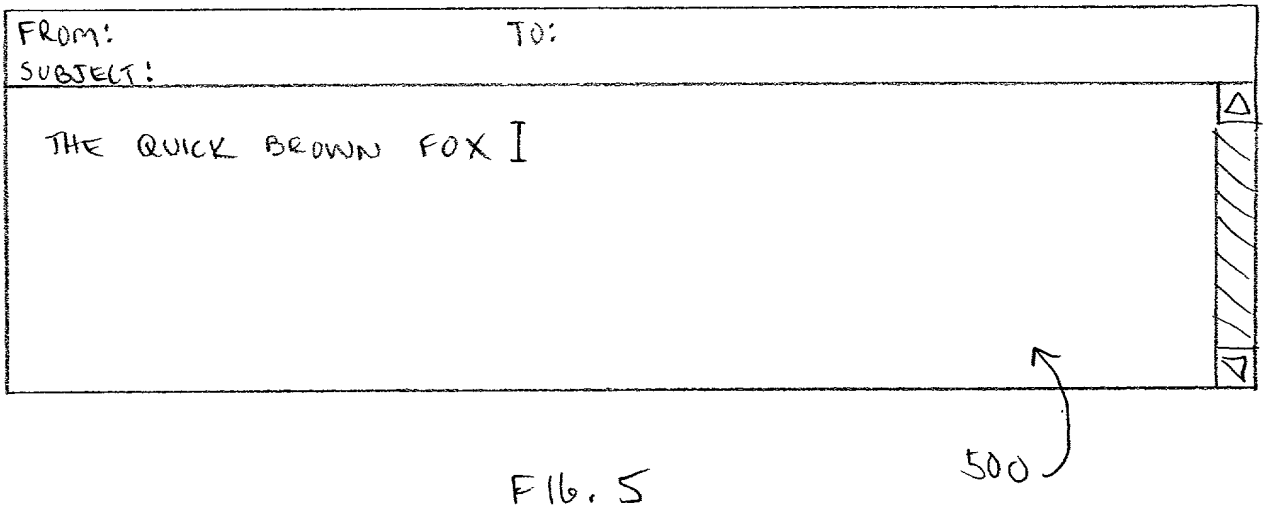

FROM:
TO:
SUBJECT:
THE QUICK BROWN FOX
500

FIG. 5

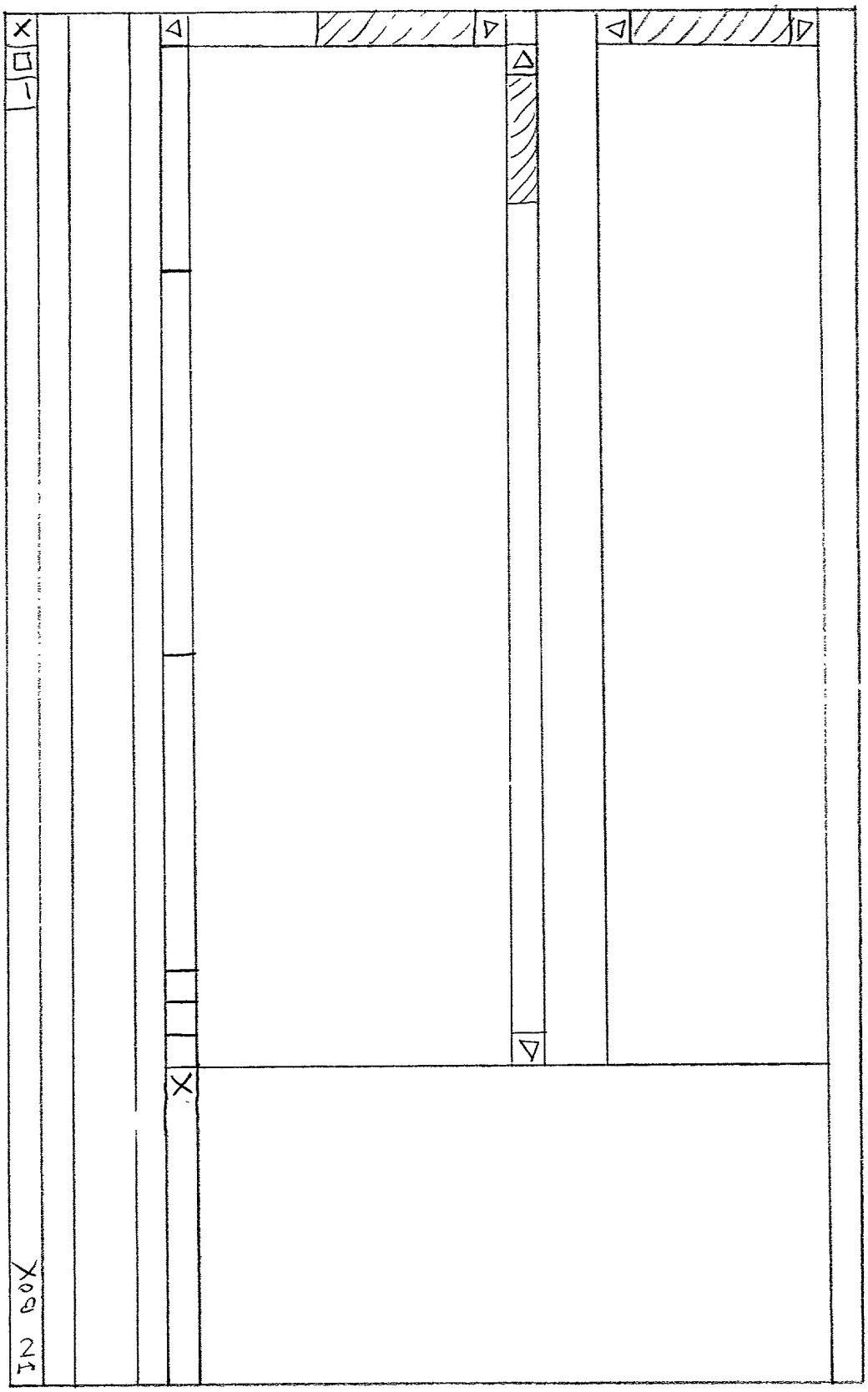


FIG. 6

600

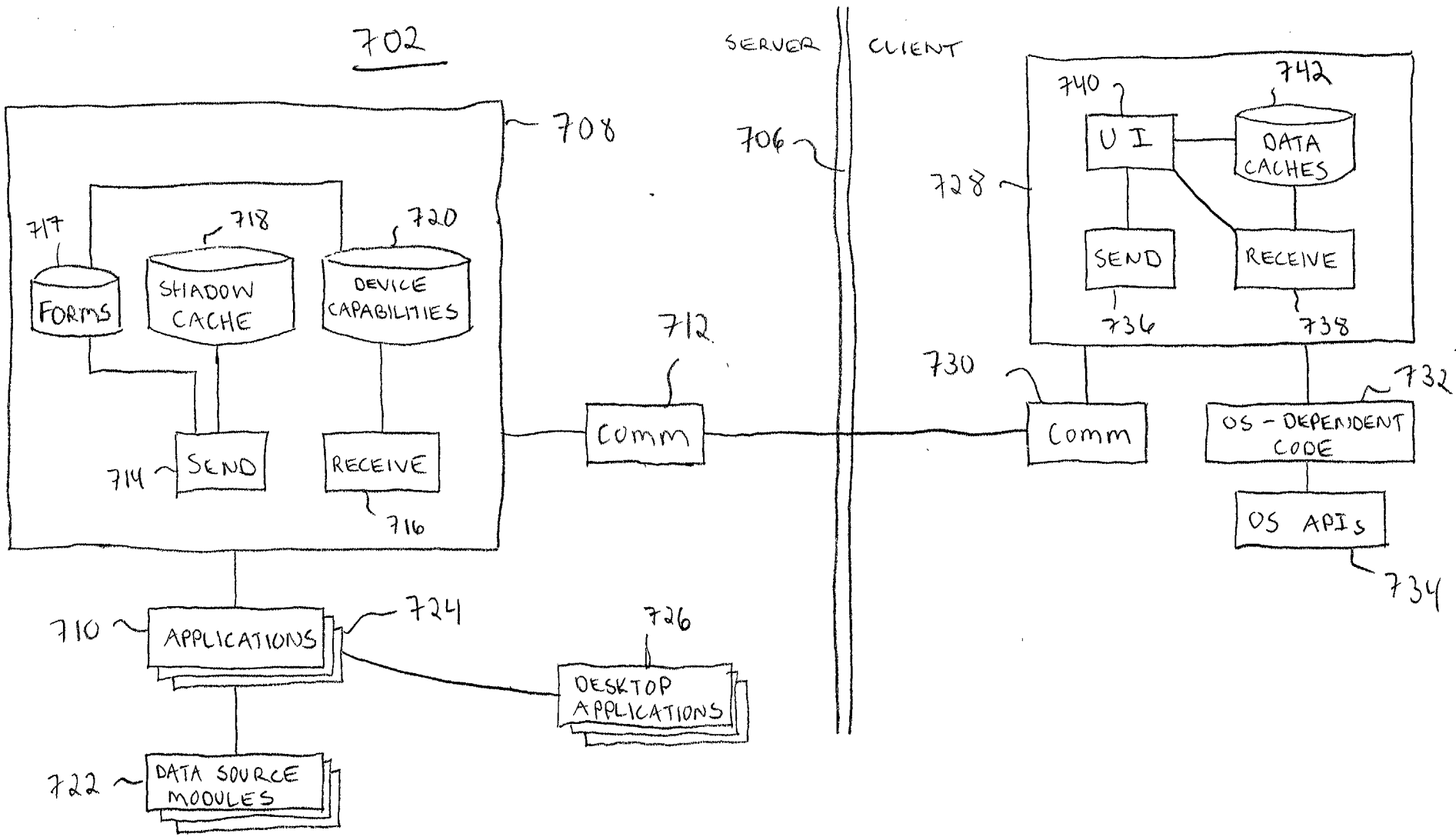

702
SERVER
CLIENT
708
706
717
FORMS
718
SHADOW CACHE
720
DEVICE CAPABILITIES
712
714
SEND
RECEIVE
716
Comm
710
APPLICATIONS
724
726
DESKTOP APPLICATIONS
722
DATA SOURCE MOODLES
728
740
UI
742
DATA CACHES
SEND
RECEIVE
736
738
730
Comm
732
OS - DEPENDENT CODE
OS APIs
734

FIG. 7

800

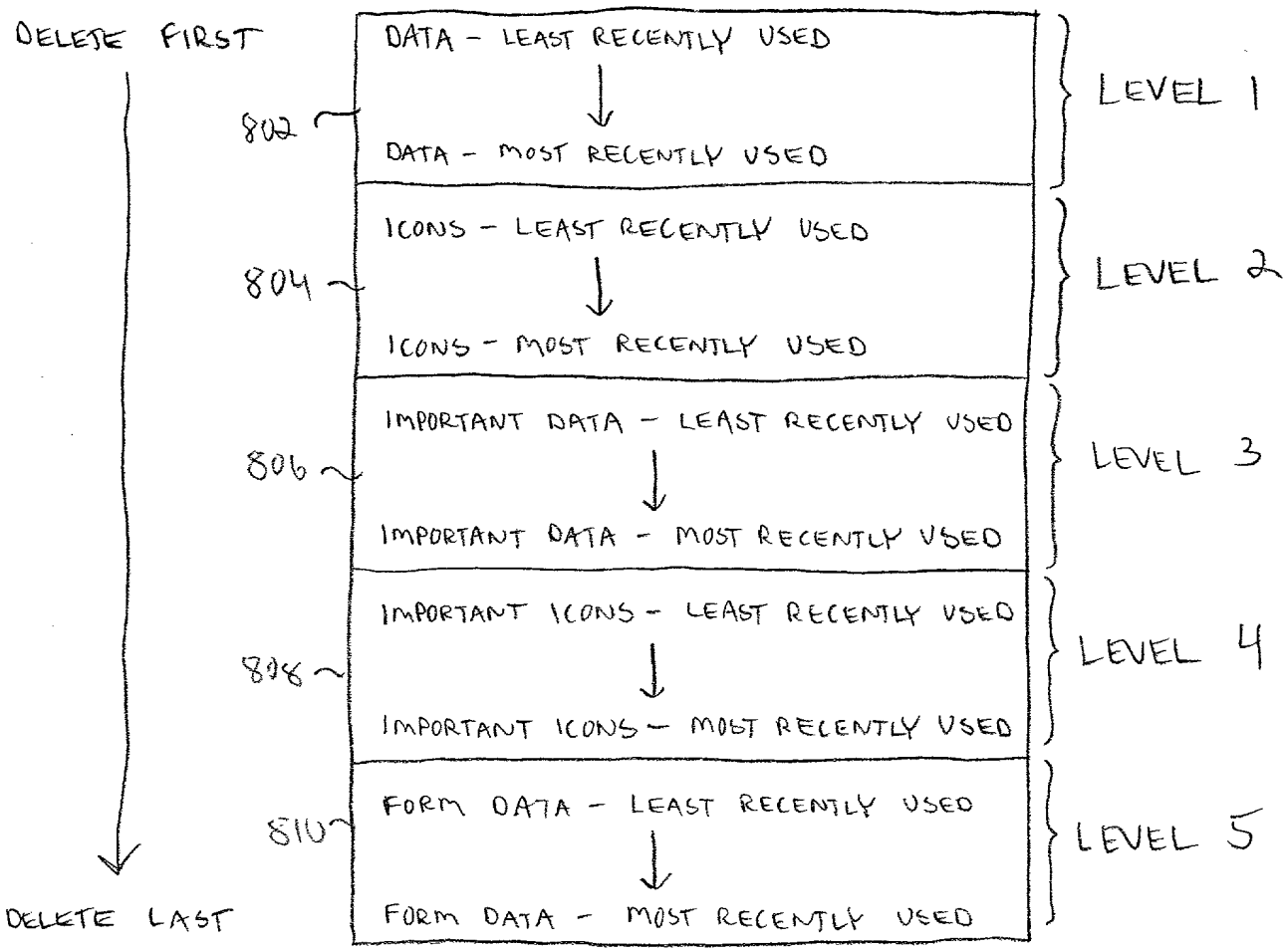
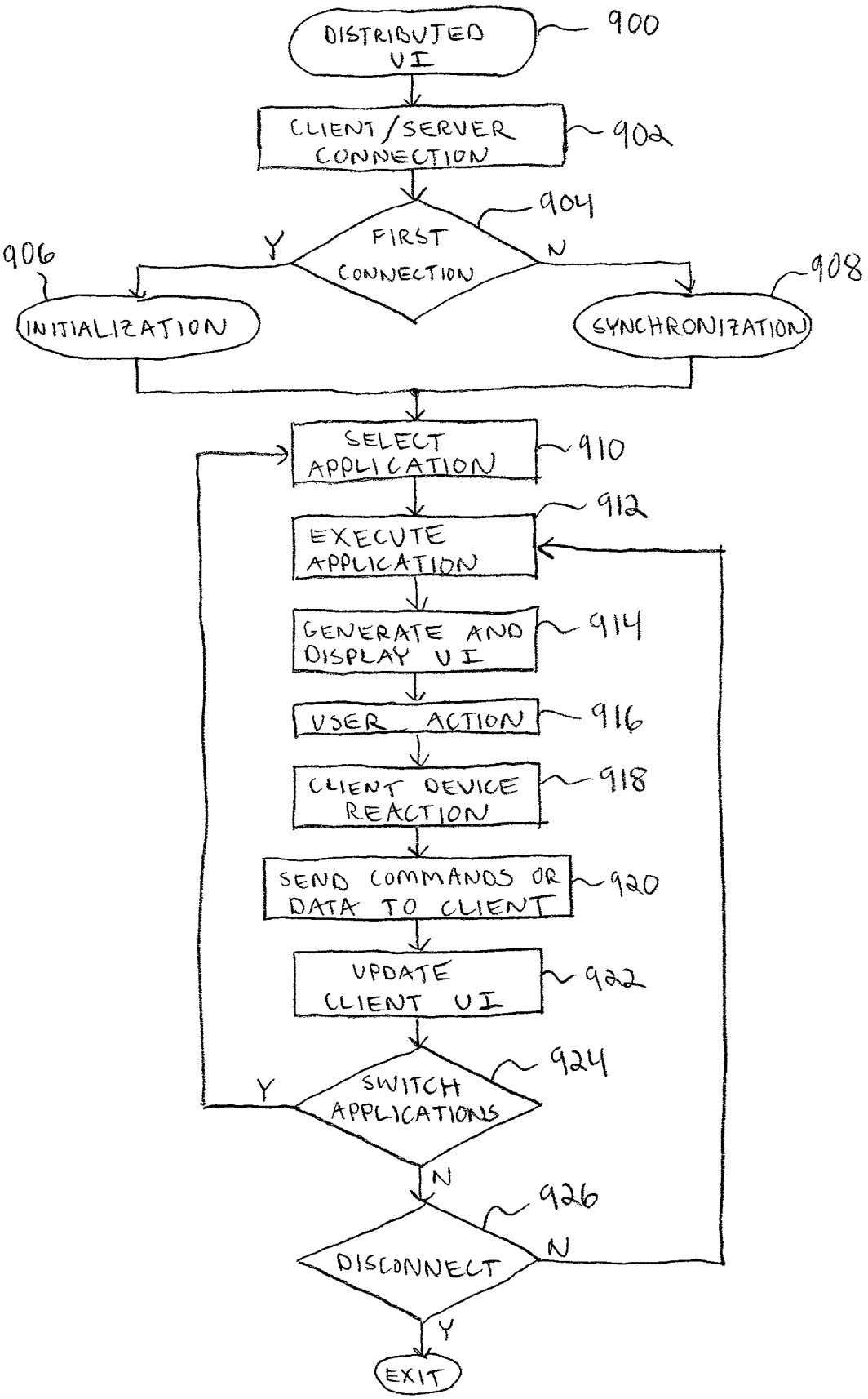

DELETE FIRST
DELETE LAST
802
DATA - LEAST RECENTLY USED
DATA - MOST RECENTLY USED
LEVEL 1
804
ICONS - LEAST RECENTLY USED
ICONS - MOST RECENTLY USED
LEVEL 2
806
IMPORTANT DATA - LEAST RECENTLY USED
IMPORTANT DATA - MOST RECENTLY USED
LEVEL 3
808
IMPORTANT ICONS - LEAST RECENTLY USED
IMPORTANT ICONS - MOST RECENTLY USED
LEVEL 4
810
FORM DATA - LEAST RECENTLY USED
FORM DATA - MOST RECENTLY USED
LEVEL 5

FIG. 8


DISTRIBUTED UI
900
CLIENT/SERVER CONNECTION
902
FIRST CONNECTION
904
Y
N
906
908
INITIALIZATION
SYNCHRONIZATION
SELECT APPLICATION
910
EXECUTE APPLICATION
912
GENERATE AND DISPLAY UI
914
USER ACTION
916
CLIENT DEVICE REACTION
918
SEND COMMANDS OR DATA TO CLIENT
920
UPDATE CLIENT UI
922
SWITCH APPLICATIONS
924
Y
N
DISCONNECT
926
N
Y
EXIT

F16. 9

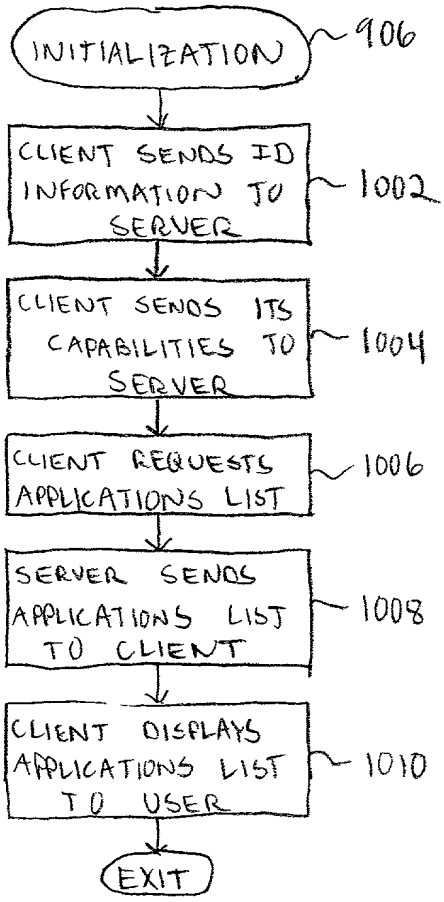
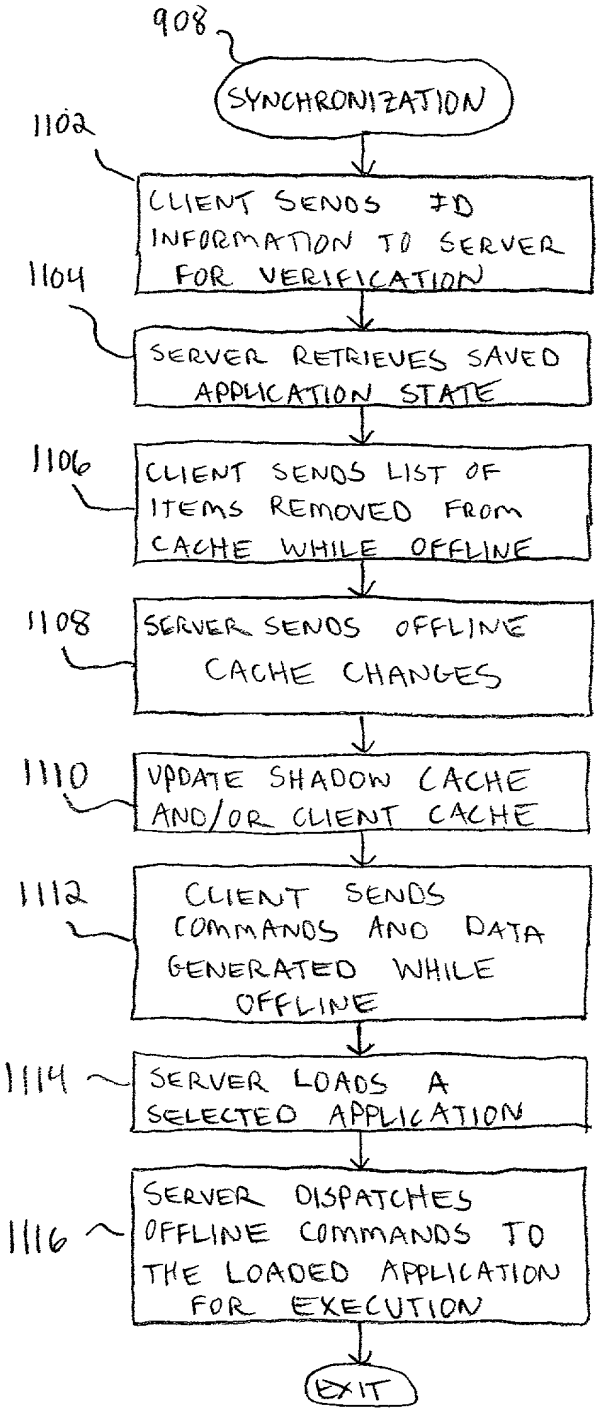

INITIALIZATION
906
CLIENT SENDS ID INFORMATION TO SERVER
1002
CLIENT SENDS ITS CAPABILITIES TO SERVER
1004
CLIENT REQUESTS APPLICATIONS LIST
1006
SERVER SENDS APPLICATIONS LIST TO CLIENT
1008
CLIENT DISPLAYS APPLICATIONS LIST TO USER
1010
EXIT

Fig. 10


908
SYNCHRONIZATION
1102
CLIENT SENDS ID INFORMATION TO SERVER FOR VERIFICATION
1104
SERVER RETRIEVES SAVED APPLICATION STATE
1106
CLIENT SENDS LIST OF ITEMS REMOVED FROM CACHE WHILE OFFLINE
1108
SERVER SENDS OFFLINE CACHE CHANGES
1110
UPDATE SHADOW CACHE AND/OR CLIENT CACHE
1112
CLIENT SENDS COMMANDS AND DATA GENERATED WHILE OFFLINE
1114
SERVER LOADS A SELECTED APPLICATION
1116
SERVER DISPATCHES OFFLINE COMMANDS TO THE LOADED APPLICATION FOR EXECUTION
EXIT

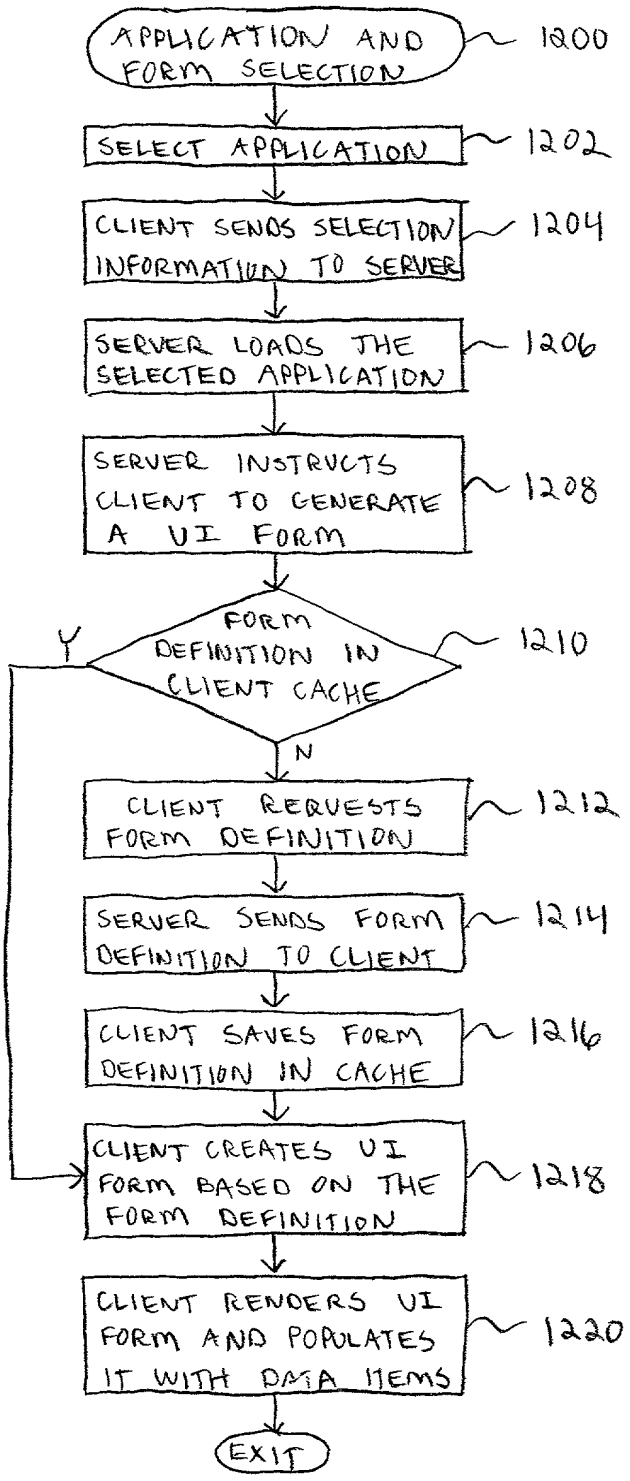

APPLICATION AND FORM SELECTION
1200
SELECT APPLICATION
1202
CLIENT SENDS SELECTION INFORMATION TO SERVER
1204
SERVER LOADS THE SELECTED APPLICATION
1206
SERVER INSTRUCTS CLIENT TO GENERATE A UI FORM
1208
FORM DEFINITION IN CLIENT CACHE
1210
Y
N
CLIENT REQUESTS FORM DEFINITION
1212
SERVER SENDS FORM DEFINITION TO CLIENT
1214
CLIENT SAVES FORM DEFINITION IN CACHE
1216
CLIENT CREATES UI FORM BASED ON THE FORM DEFINITION
1218
CLIENT RENDERS UI FORM AND POPULATES IT WITH DATA ITEMS
1220
EXIT

FIG. 12

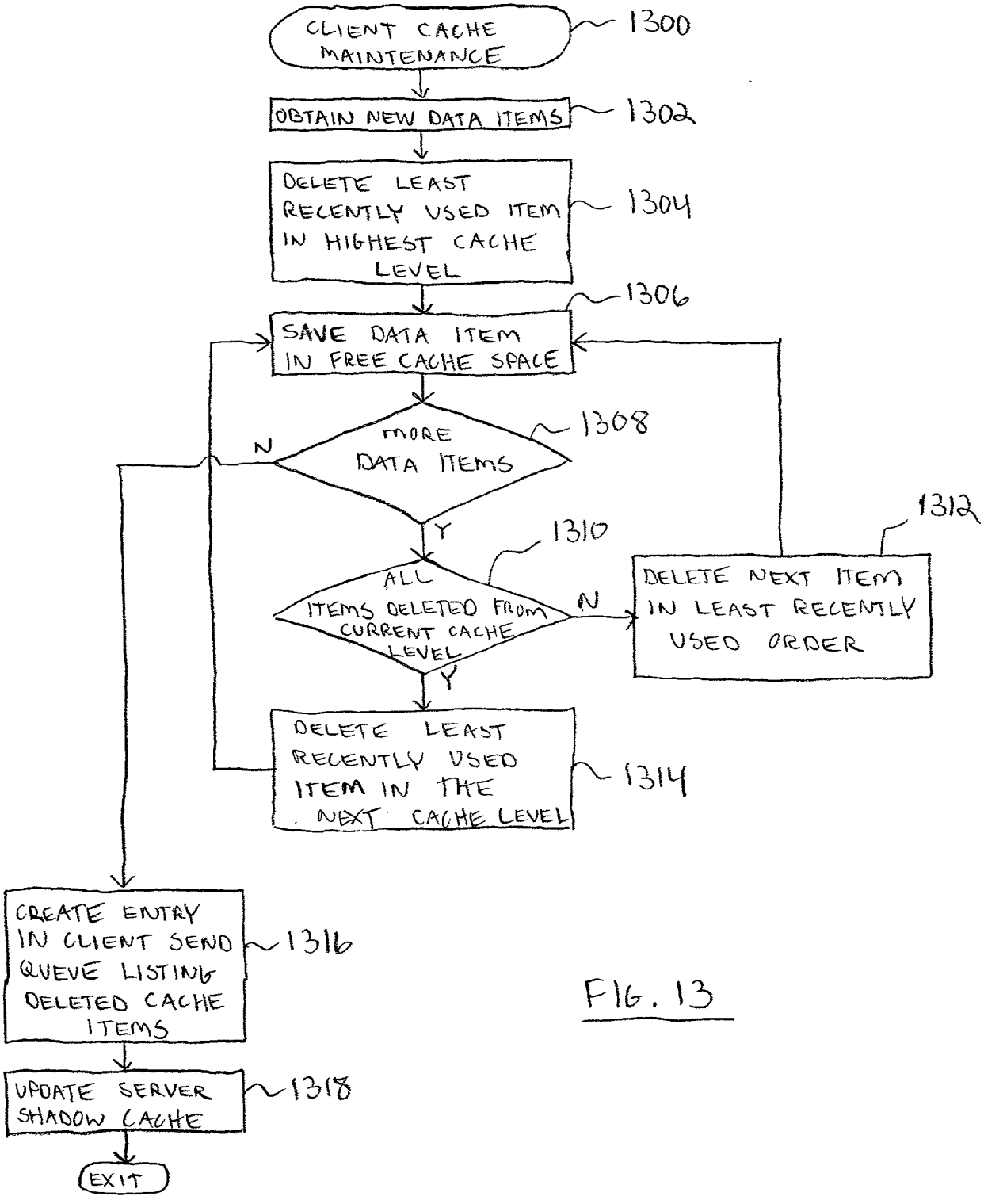

CLIENT CACHE MAINTENANCE
1300
OBTAIN NEW DATA ITEMS
1302
DELETE LEAST RECENTLY USED ITEM IN HIGHEST CACHE LEVEL
1304
SAVE DATA ITEM IN FREE CACHE SPACE
1306
MORE DATA ITEMS
1308
N
Y
ALL ITEMS DELETED FROM CURRENT CACHE LEVEL
1310
N
Y
DELETE NEXT ITEM IN LEAST RECENTLY USED ORDER
1312
DELETE LEAST RECENTLY USED ITEM IN THE NEXT CACHE LEVEL
1314
CREATE ENTRY IN CLIENT SEND QUEVE LISTING DELETED CACHE ITEMS
1316
UPDATE SERVER SHADOW CACHE
1318
EXIT

FIG. 13

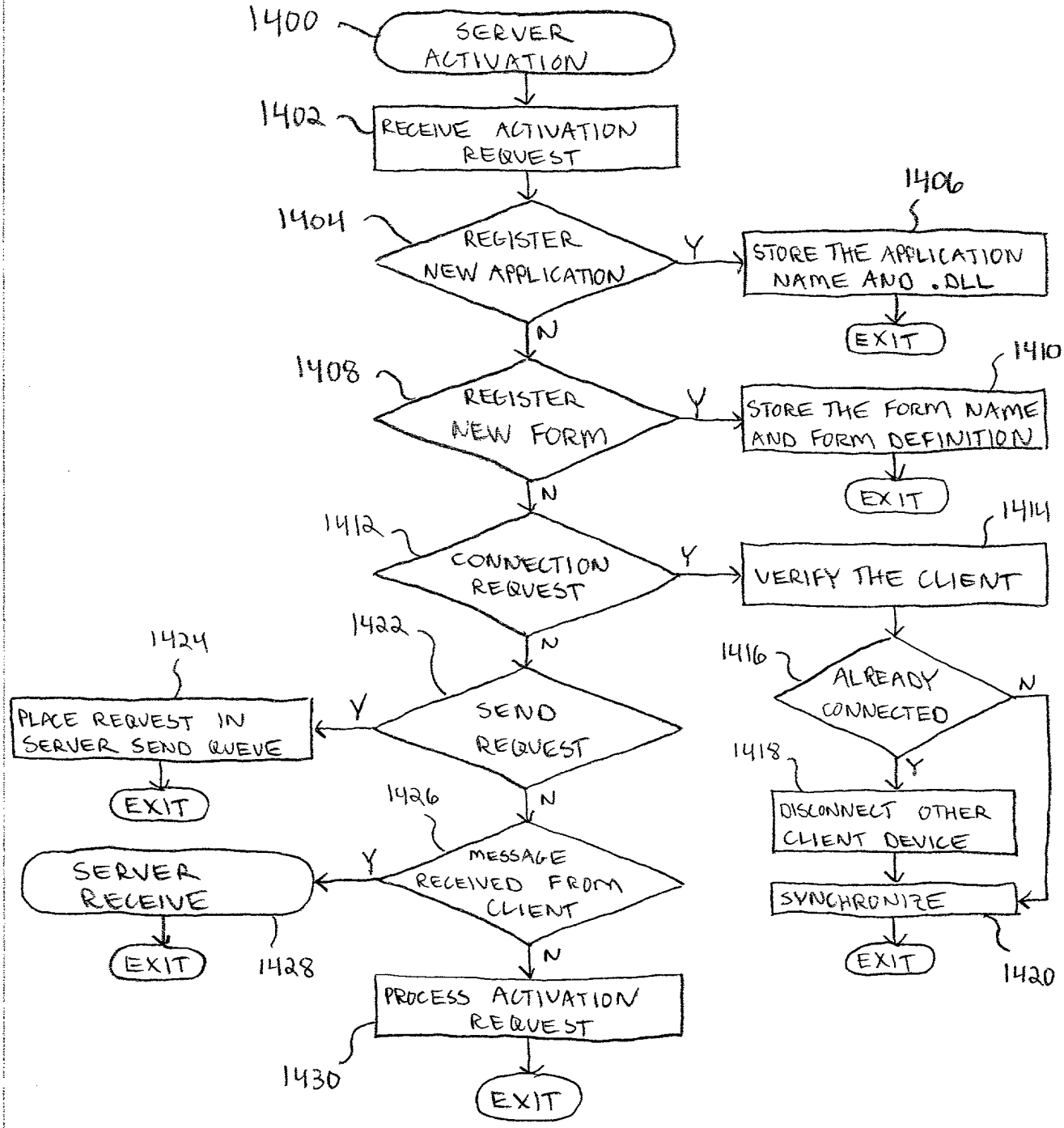

1400
SERVER ACTIVATION
1402
RECEIVE ACTIVATION REQUEST
1404
REGISTER NEW APPLICATION
Y
1406
STORE THE APPLICATION NAME AND .DLL
EXIT
N
1408
REGISTER NEW FORM
Y
1410
STORE THE FORM NAME AND FORM DEFINITION
EXIT
N
1412
CONNECTION REQUEST
Y
1414
VERIFY THE CLIENT
N
1422
1424
SEND REQUEST
Y
PLACE REQUEST IN SERVER SEND QUEVE
EXIT
1416
ALREADY CONNECTED
N
Y
1418
DISCONNECT OTHER CLIENT DEVICE
N
1426
MESSAGE RECEIVED FROM CLIENT
Y
SERVER RECEIVE
EXIT
1428
SYNCHRONIZE
EXIT
1420
N
PROCESS ACTIVATION REQUEST
1430
EXIT

FIG. 14

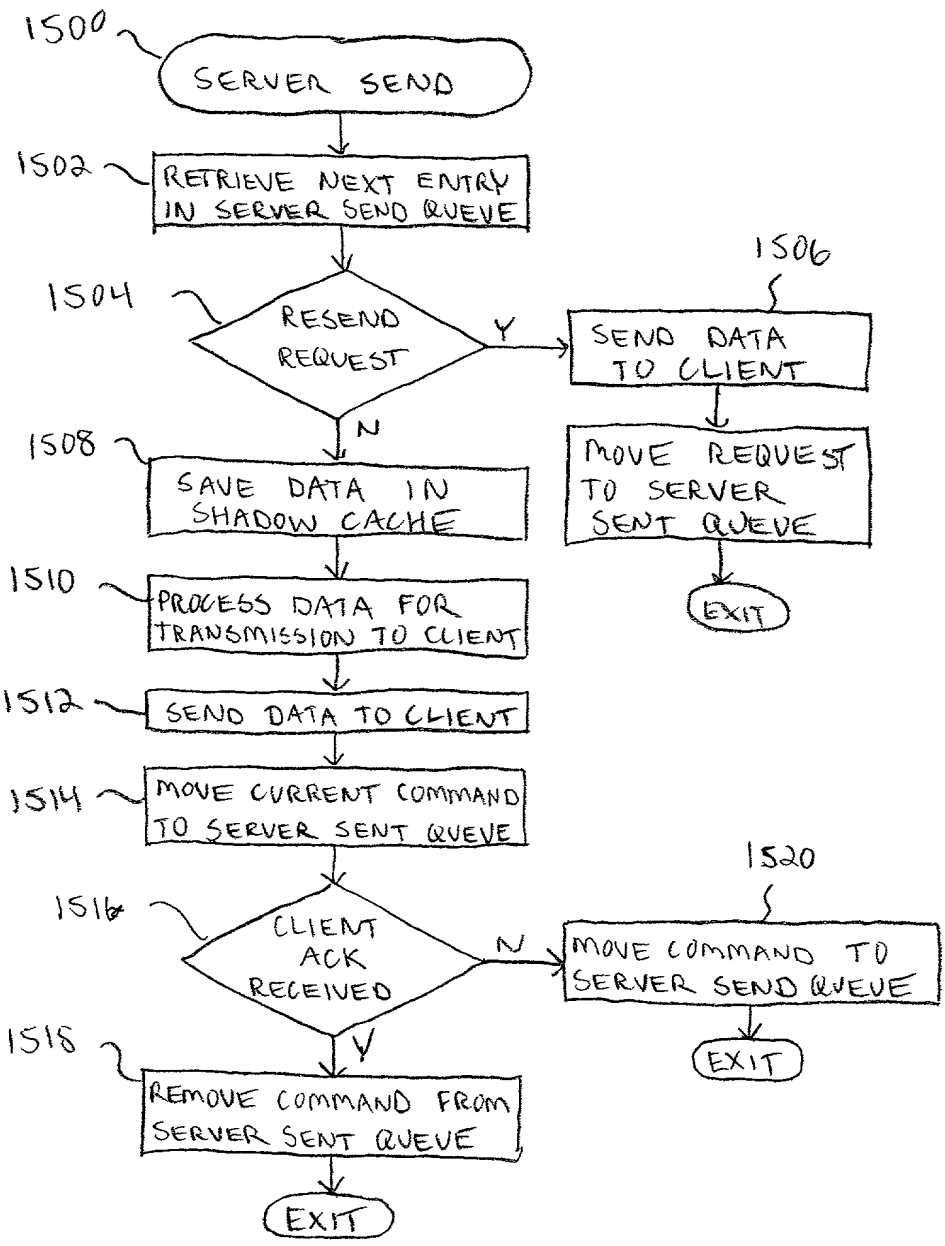

1500
SERVER SEND
1502
RETRIEVE NEXT ENTRY IN SERVER SEND QUEVE
1504
RESEND REQUEST
Y
1506
SEND DATA TO CLIENT
MOVE REQUEST TO SERVER SENT QUEVE
EXIT
N
1508
SAVE DATA IN SHADOW CACHE
1510
PROCESS DATA FOR TRANSMISSION TO CLIENT
1512
SEND DATA TO CLIENT
1514
MOVE CURRENT COMMAND TO SERVER SENT QUEVE
1516
CLIENT ACK RECEIVED
N
1520
MOVE COMMAND TO SERVER SEND QUEVE
EXIT
Y
1518
REMOVE COMMAND FROM SERVER SENT QUEVE
EXIT

FIG. 15

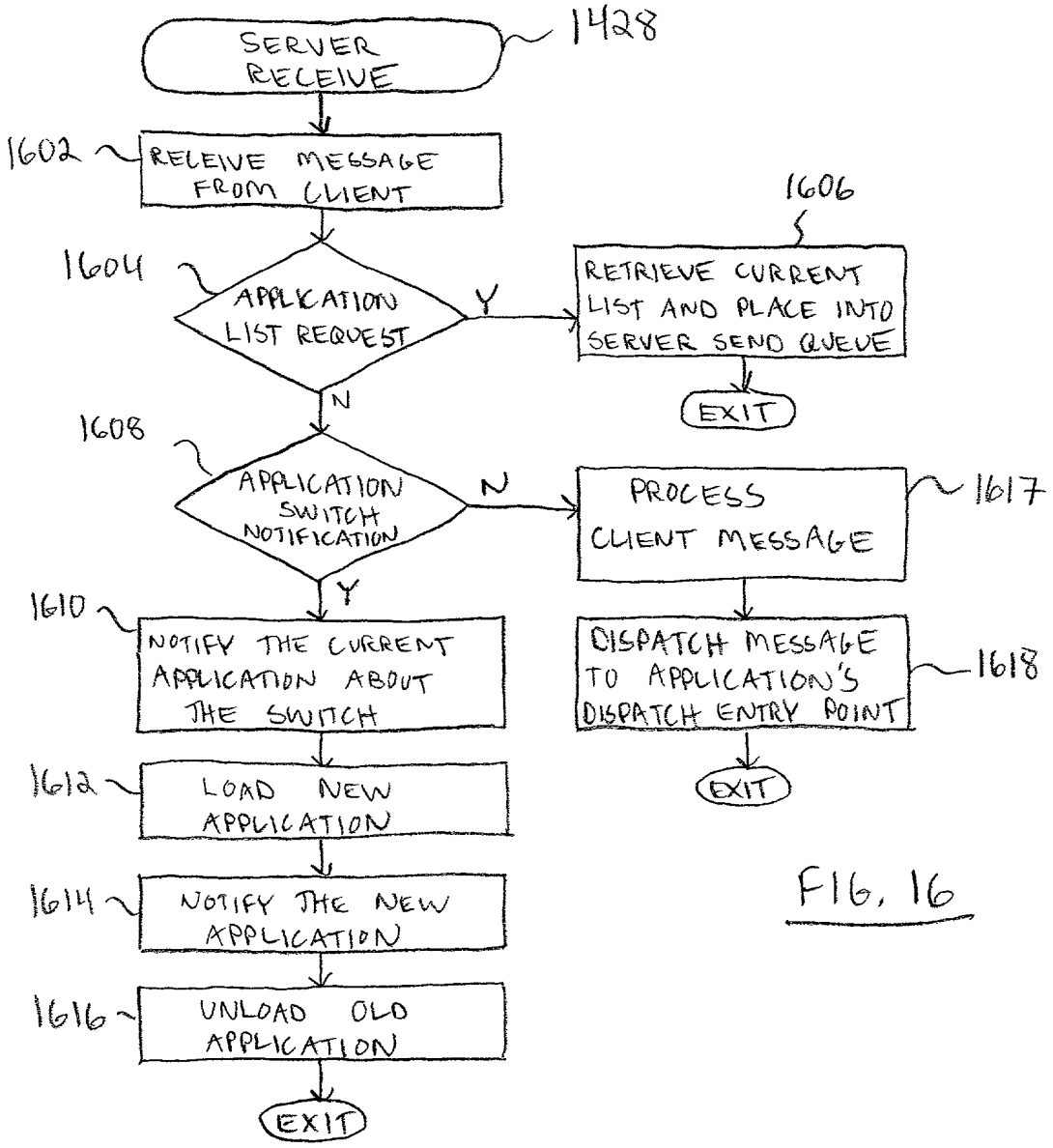

SERVER RECEIVE
1428
1602
RECEIVE MESSAGE FROM CLIENT
1604
APPLICATION LIST REQUEST
Y
1606
RETRIEVE CURRENT LIST AND PLACE INTO SERVER SEND QUEUE
EXIT
N
1608
APPLICATION SWITCH NOTIFICATION
N
PROCESS CLIENT MESSAGE
1617
Y
1610
NOTIFY THE CURRENT APPLICATION ABOUT THE SWITCH
DISPATCH MESSAGE TO APPLICATION'S DISPATCH ENTRY POINT
1618
EXIT
1612
LOAD NEW APPLICATION
1614
NOTIFY THE NEW APPLICATION
1616
UNLOAD OLD APPLICATION
EXIT

FIG. 16

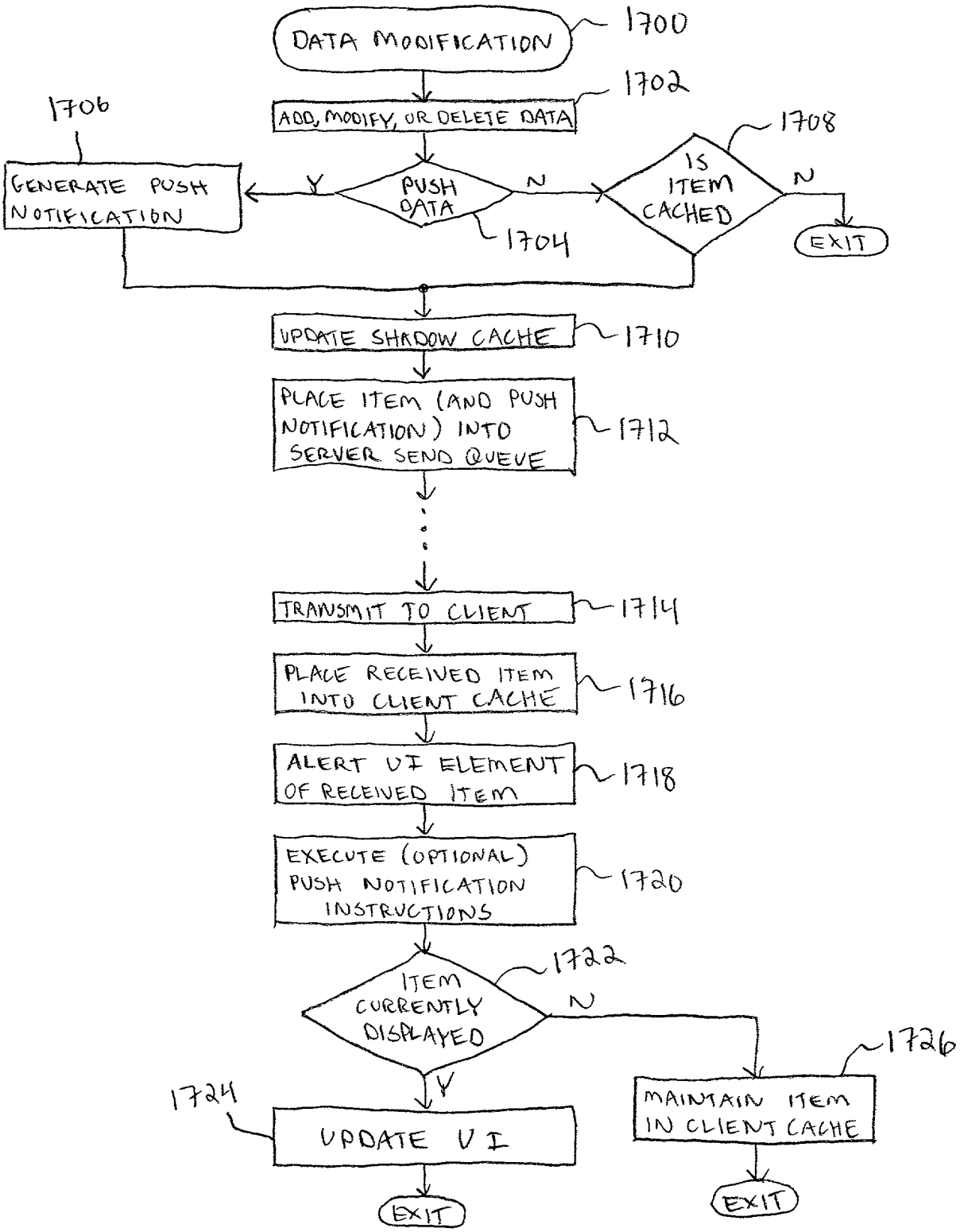

DATA MODIFICATION
1700
ADD, MODIFY, OR DELETE DATA
1702
PUSH DATA
1704
Y
N
GENERATE PUSH NOTIFICATION
1706
IS ITEM CACHED
1708
N
EXIT
UPDATE SHADOW CACHE
1710
PLACE ITEM (AND PUSH NOTIFICATION) INTO SERVER SEND QUEUE
1712
TRANSMIT TO CLIENT
1714
PLACE RECEIVED ITEM INTO CLIENT CACHE
1716
ALERT UI ELEMENT OF RECEIVED ITEM
1718
EXECUTE (OPTIONAL) PUSH NOTIFICATION INSTRUCTIONS
1720
ITEM CURRENTLY DISPLAYED
1722
N
Y
1724
UPDATE UI
EXIT
MAINTAIN ITEM IN CLIENT CACHE
1726
EXIT

FIG. 17

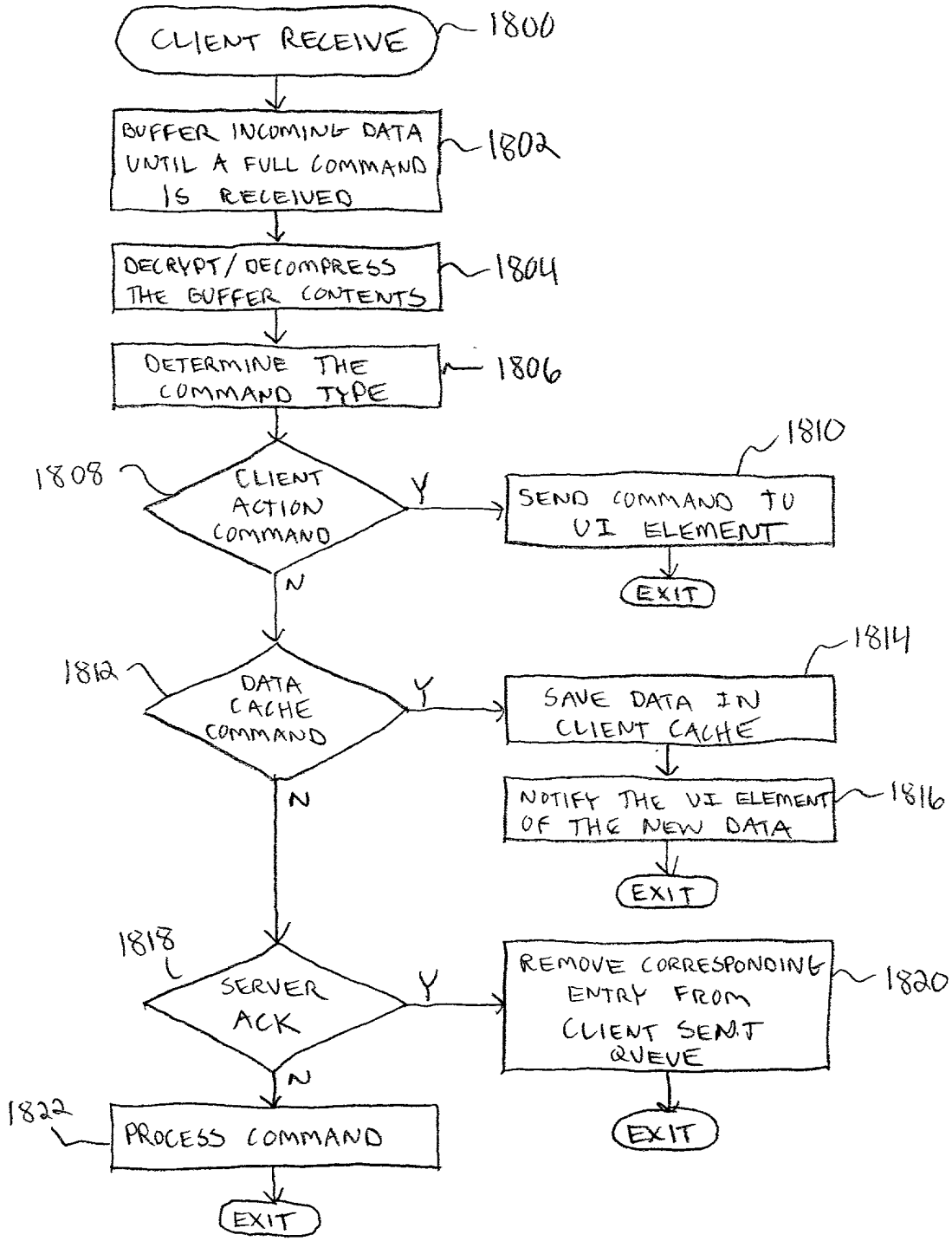
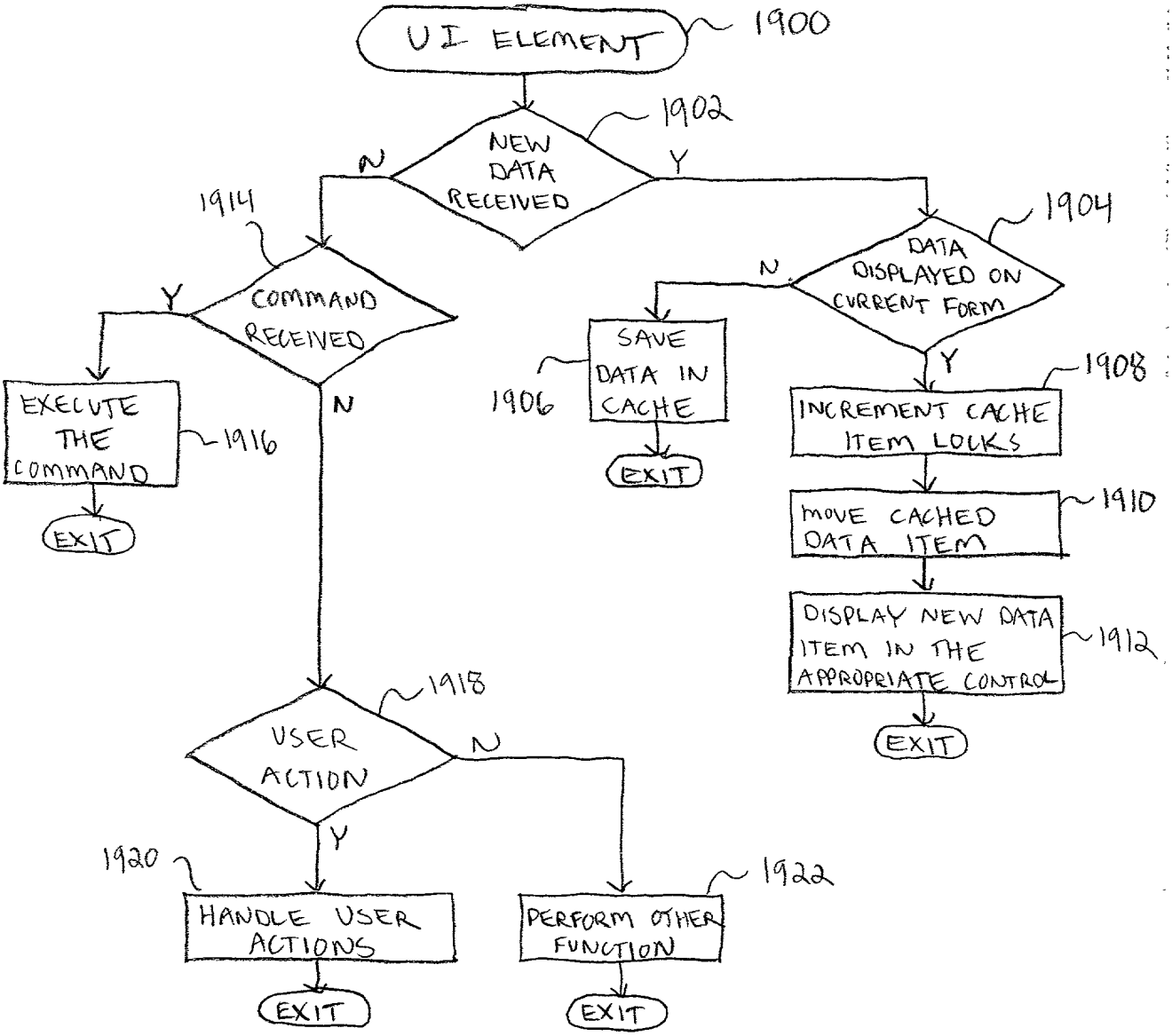

CLIENT RECEIVE
1800
BUFFER INCOMING DATA UNTIL A FULL COMMAND IS RECEIVED
1802
DECRYPT/DECOMPRESS THE BUFFER CONTENTS
1804
DETERMINE THE COMMAND TYPE
1806
1808
CLIENT ACTION COMMAND
Y
N
1810
SEND COMMAND TO UI ELEMENT
EXIT
1812
DATA CACHE COMMAND
Y
N
1814
SAVE DATA IN CLIENT CACHE
NOTIFY THE UI ELEMENT OF THE NEW DATA
1816
EXIT
1818
SERVER ACK
Y
N
REMOVE CORRESPONDING ENTRY FROM CLIENT SENT QUEUE
1820
EXIT
1822
PROCESS COMMAND
EXIT

FIG. 18


UI ELEMENT
1900
NEW DATA RECEIVED
1902
N
Y
1914
COMMAND RECEIVED
Y
N
EXECUTE THE COMMAND
1916
EXIT
1904
DATA DISPLAYED ON CURRENT FORM
N
Y
SAVE DATA IN CACHE
1906
EXIT
1908
INCREMENT CACHE ITEM LOCKS
1910
MOVE CACHED DATA ITEM
DISPLAY NEW DATA ITEM IN THE APPROPRIATE CONTROL
1912
EXIT
1918
USER ACTION
N
Y
1920
HANDLE USER ACTIONS
EXIT
1922
PERFORM OTHER FUNCTION
EXIT

F16, 19

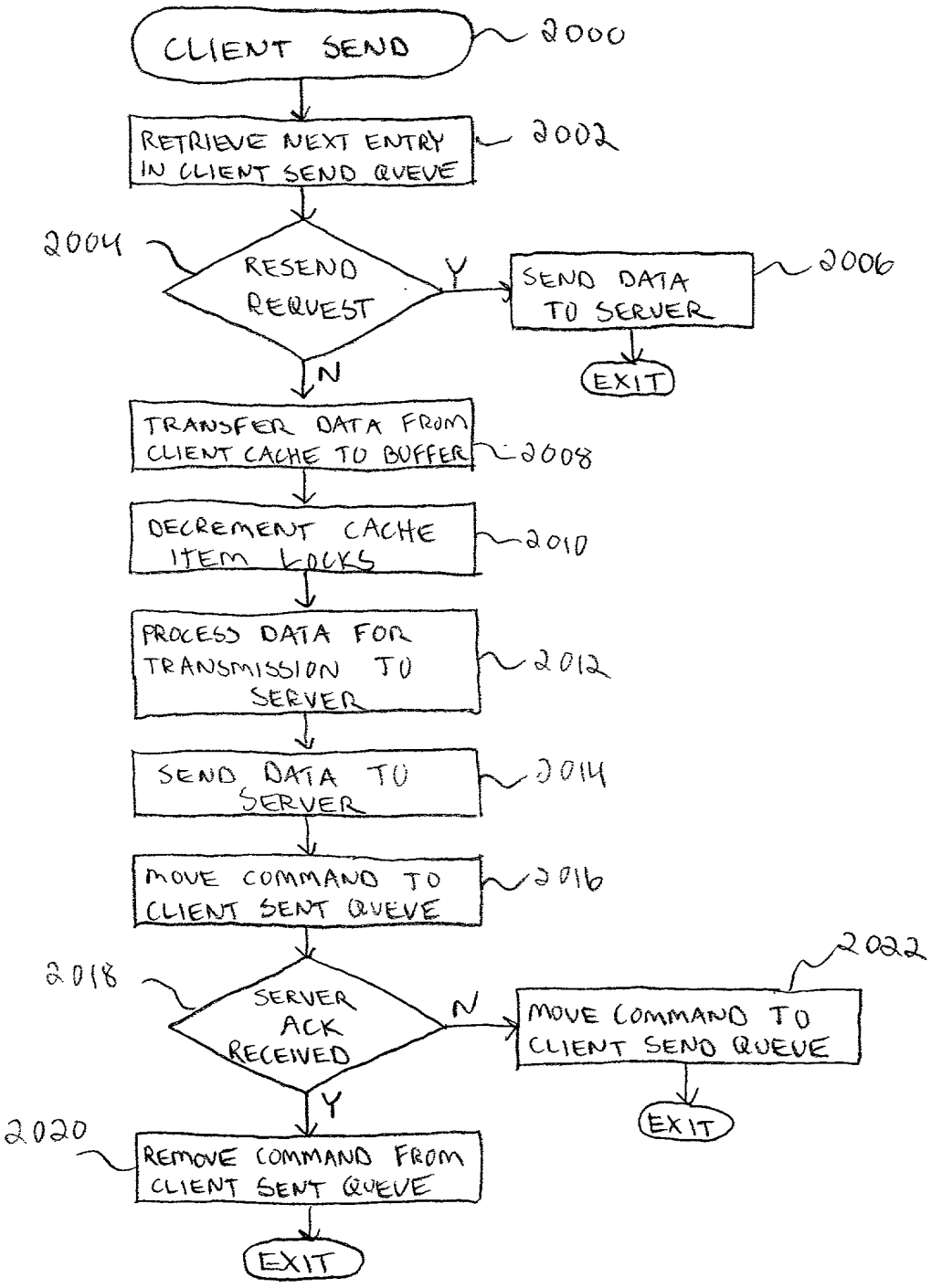

CLIENT SEND
2000
RETRIEVE NEXT ENTRY IN CLIENT SEND QUEUE
2002
2004
RESEND REQUEST
Y
SEND DATA TO SERVER
2006
EXIT
N
TRANSFER DATA FROM CLIENT CACHE TO BUFFER
2008
DECREMENT CACHE ITEM LOCKS
2010
PROCESS DATA FOR TRANSMISSION TO SERVER
2012
SEND DATA TO SERVER
2014
MOVE COMMAND TO CLIENT SENT QUEUE
2016
2018
SERVER ACK RECEIVED
N
2022
MOVE COMMAND TO CLIENT SEND QUEUE
EXIT
Y
2020
REMOVE COMMAND FROM CLIENT SENT QUEUE
EXIT

FIG. 20

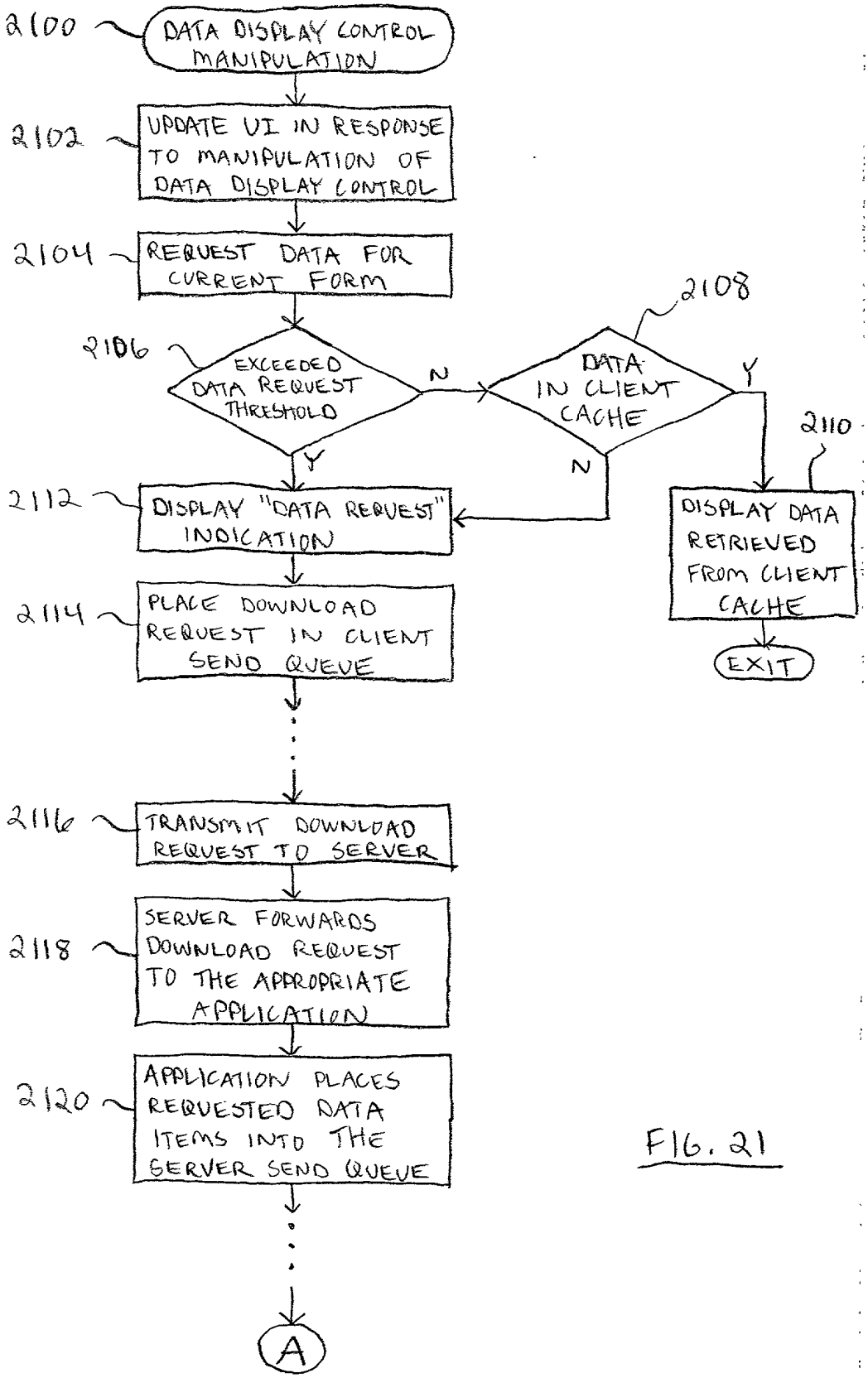

2100
DATA DISPLAY CONTROL MANIPULATION
2102
UPDATE UI IN RESPONSE TO MANIPULATION OF DATA DISPLAY CONTROL
2104
REQUEST DATA FOR CURRENT FORM
2106
EXCEEDED DATA REQUEST THRESHOLD
N
2108
DATA IN CLIENT CACHE
Y
2110
DISPLAY DATA RETRIEVED FROM CLIENT CACHE
EXIT
Y
N
2112
DISPLAY "DATA REQUEST" INDICATION
2114
PLACE DOWNLOAD REQUEST IN CLIENT SEND QUEUE
2116
TRANSMIT DOWNLOAD REQUEST TO SERVER
2118
SERVER FORWARDS DOWNLOAD REQUEST TO THE APPROPRIATE APPLICATION
2120
APPLICATION PLACES REQUESTED DATA ITEMS INTO THE SERVER SEND QUEUE
A

FIG. 21

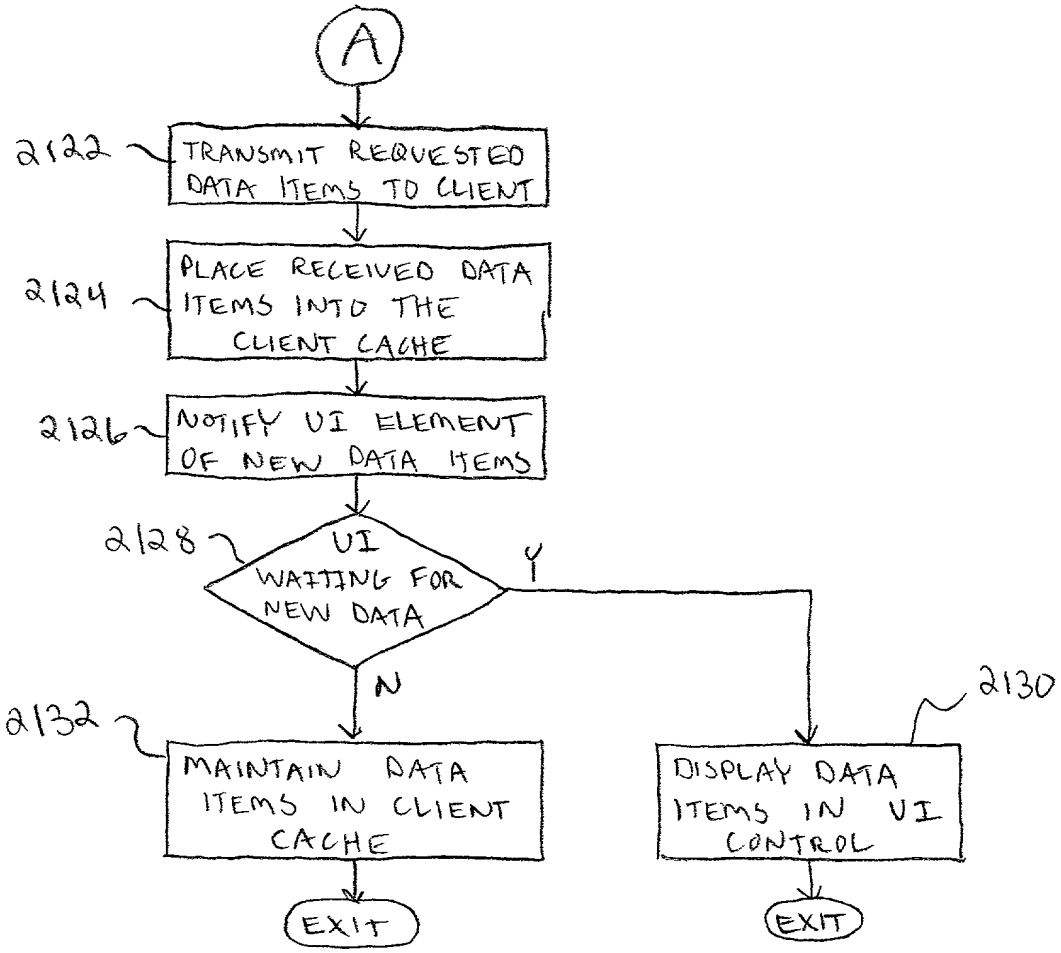

A
2122
TRANSMIT REQUESTED DATA ITEMS TO CLIENT
2124
PLACE RECEIVED DATA ITEMS INTO THE CLIENT CACHE
2126
NOTIFY UI ELEMENT OF NEW DATA ITEMS
2128
UI WAITING FOR NEW DATA
Y
N
2130
2132
MAINTAIN DATA ITEMS IN CLIENT CACHE
DISPLAY DATA ITEMS IN UI CONTROL
EXIT
EXIT

FIG. 22

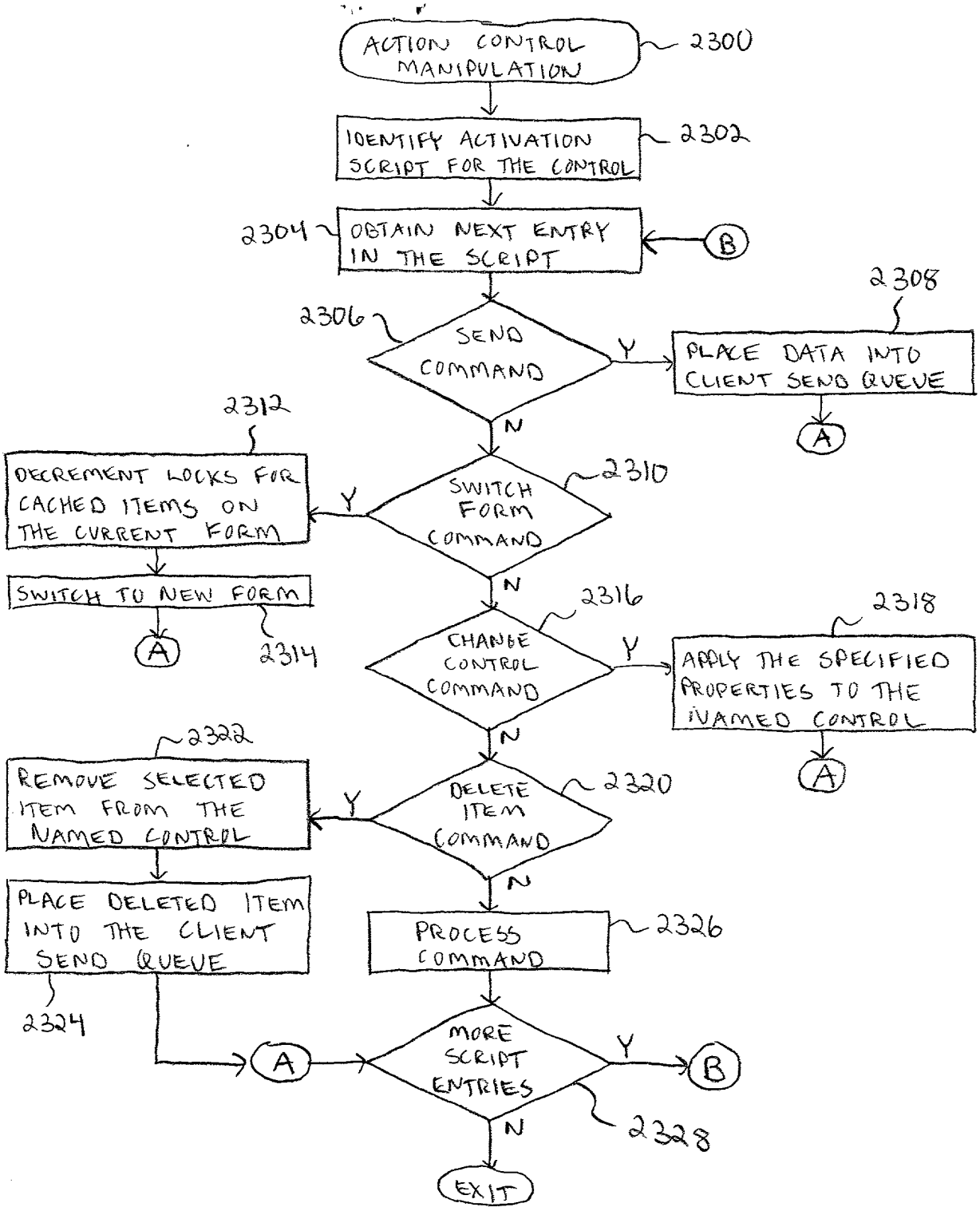

ACTION CONTROL MANIPULATION
2300
IDENTIFY ACTIVATION SCRIPT FOR THE CONTROL
2302
2304
OBTAIN NEXT ENTRY IN THE SCRIPT
B
2306
SEND COMMAND
Y
2308
PLACE DATA INTO CLIENT SEND QUEUE
A
N
2312
DECREMENT LOCKS FOR CACHED ITEMS ON THE CURRENT FORM
Y
SWITCH FORM COMMAND
2310
N
SWITCH TO NEW FORM
A
2314
2316
CHANGE CONTROL COMMAND
Y
2318
APPLY THE SPECIFIED PROPERTIES TO THE NAMED CONTROL
A
N
2322
REMOVE SELECTED ITEM FROM THE NAMED CONTROL
Y
DELETE ITEM COMMAND
2320
N
PLACE DELETED ITEM INTO THE CLIENT SEND QUEUE
2324
PROCESS COMMAND
2326
A
MORE SCRIPT ENTRIES
Y
B
2328
N
EXIT

FIG. 23

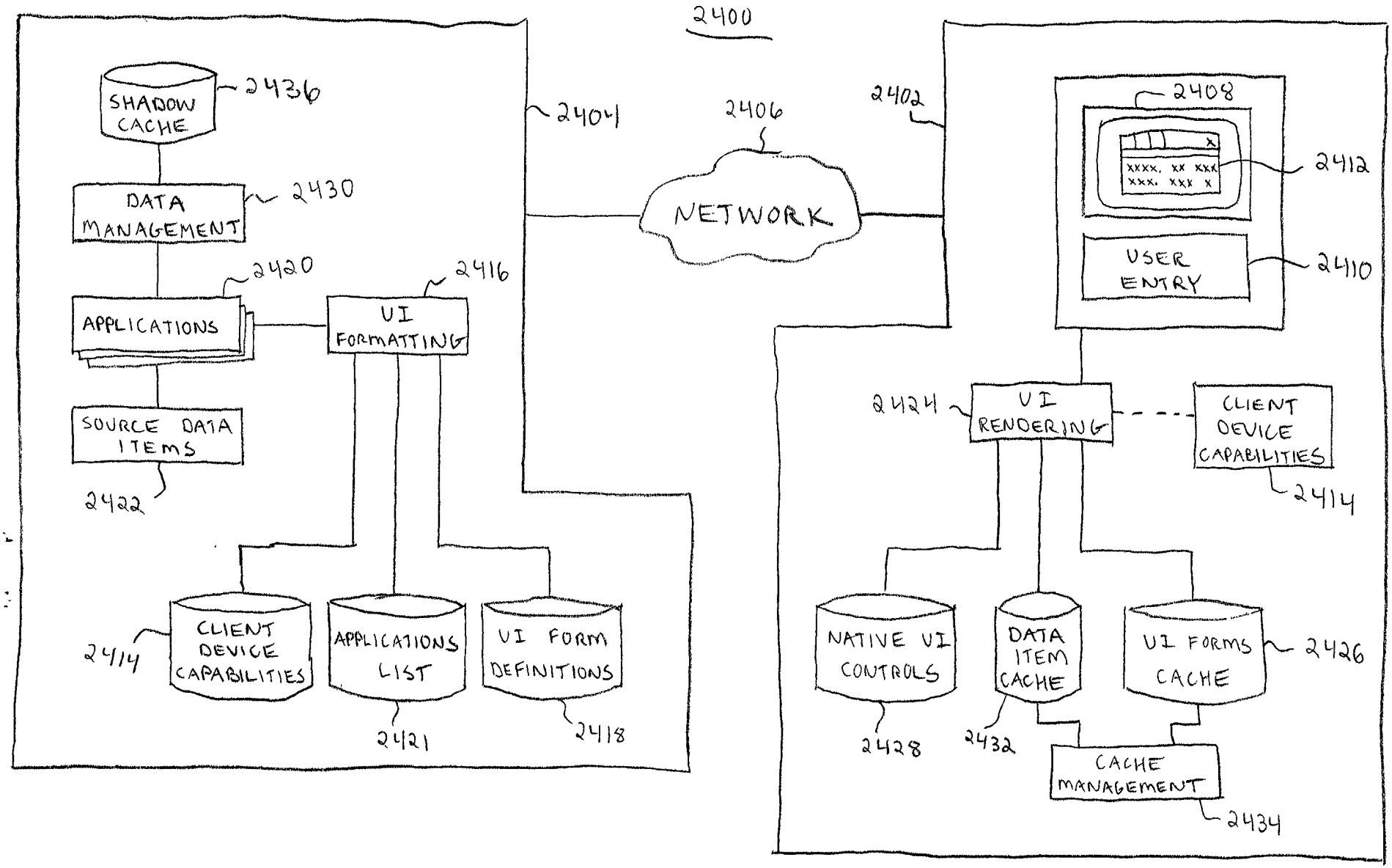

2400
SHADOW CACHE
2436
2404
2406
2402
2408
DATA MANAGEMENT
2430
NETWORK
2412
USER ENTRY
2410
APPLICATIONS
2420
UI FORMATTING
2416
SOURCE DATA ITEMS
2422
2424
UI RENDERING
CLIENT DEVICE CAPABILITIES
2414
2414
CLIENT DEVICE CAPABILITIES
APPLICATIONS LIST
2421
UI FORM DEFINITIONS
2418
NATIVE UI CONTROLS
2428
DATA ITEM CACHE
2432
UI FORMS CACHE
2426
CACHE MANAGEMENT
2434

FIG. 24